

*TRICHOSTEMA RUYGTII* (LAMIACEAE): A NEW SPECIES FROM  
NAPA COUNTY, CALIFORNIA

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ABSTRACT

*Trichostema ruygtii* is described from Napa County, California. It is closely related to *T. lanceolatum* Benth. but differs from that species most conspicuously in having much smaller flowers with notably shorter stamens. Both species occur in Napa County but occupy somewhat different habitats and have not been found growing together.

Key Words: Lamiaceae, California, new species, *Trichostema ruygtii*, *Trichostema lanceolatum*.

Jake Ruygt, who is writing a flora of Napa County, California, wrote to me in the summer of 2003, asking for help in the identification of a species of *Trichostema*. He had been reporting locations of this plant to the California Natural Diversity Database for a number of years as *Trichostema rubisepalum*, a rare species known only from the foothills of the Sierra Nevada in Tuolumne and adjacent counties and a small disjunct area in San Benito County. The identification had been made by Joe Callizo, a knowledgeable local botanist, 20 or more years ago and had not been questioned until Mingjuan Huang, a Ph.D. student at Ohio State University, referred to these plants in her studies as *T. lanceolatum* based on my identification of a pressed specimen she sent to me in 1997.

Faced with alternative names, Jake Ruygt compared his material with collections at University of California Berkeley and with living populations of *T. lanceolatum*. He became convinced that the plants he had been reporting as *T. rubisepalum* were not that species and that they did not appear to be *T. lanceolatum* either. The photographs he enclosed suggested that further study was desirable and at my request he sent me pressed specimens from five populations. Although numerous morphological similarities indicated a very close relationship to *T. lanceolatum*, consistent floral differences convinced me that the questioned plants represented a distinct undescribed taxon.

Because floral traits are difficult to measure in pressed specimens of this and related taxa, I suggested to Jake Ruygt that he make additional field observations during the next flowering season and measure appropriate samples of living material from several different populations including at least one Napa County population of *T. lanceolatum*.

Since Jake Ruygt not only brought attention to the problem but provided all of the field observations and measurements of living plants

from Napa County, I take pleasure in naming this species for him.

*Trichostema ruygtii* H. Lewis, sp. nov. (Fig. 1).—  
TYPE: California, Napa County. Mead Ranch, 2.4 km southwest of Foss Valley, *J. Ruygt* 3089, 11 July 1992. Opening in chamise chaparral. Elevation 475 m. (Holotype: JEPS; Isotypes: CAS, LA, RSA, MO).

A *Trichostemate lanceolato* Benth. staminibus minus quam 10 mm longis et stigmatibus non exsertis ultra antheras differt.

Erect annual herb to 50 cm tall, unbranched or with ascending branches in the lower half; stem and leaves viscid with capitate glands and pubescent with short curved hairs and straight spreading hairs to 2 mm long; leaves sessile or nearly so, blade lanceolate, 1–4 cm long, 2–10 mm broad, creased along the midrib, apex acute and generally pungent, base rounded or acute, ascending lateral veins arising near the base and appearing nearly parallel are usually evident on the lower surface of larger leaves; inflorescence secund with axillary racemes to 1 cm long with 1–10 flowers; pedicels 1–3 mm long; calyx in flower 3–5.5 mm long increasing to 4.2–7.5 mm in fruit, lobes deltoid to lanceolate, acute or pungent, generally equal to or somewhat shorter than the tube, the uppermost slightly narrower than the lower 4; corolla tube 5–7.5 mm long, exerted 1–3 mm beyond the calyx, curved upward and sharply bent back as the tube narrows near the throat; lower lip 2–4.5 mm long, white with numerous purple spots; lateral lobes 1.5–4 mm long, blue-violet, pinkish or white, the upper lobes erect, generally longer than the lower, the lower lip reflexed, usually speckled with purple; stamens exerted, arched, 5–9.5 mm long, anthers about 1 mm long; stigma opposite or below the anthers; nutlets alveolate with ridges and projections, 1.8–3.2 mm long, about 1.8 mm broad.

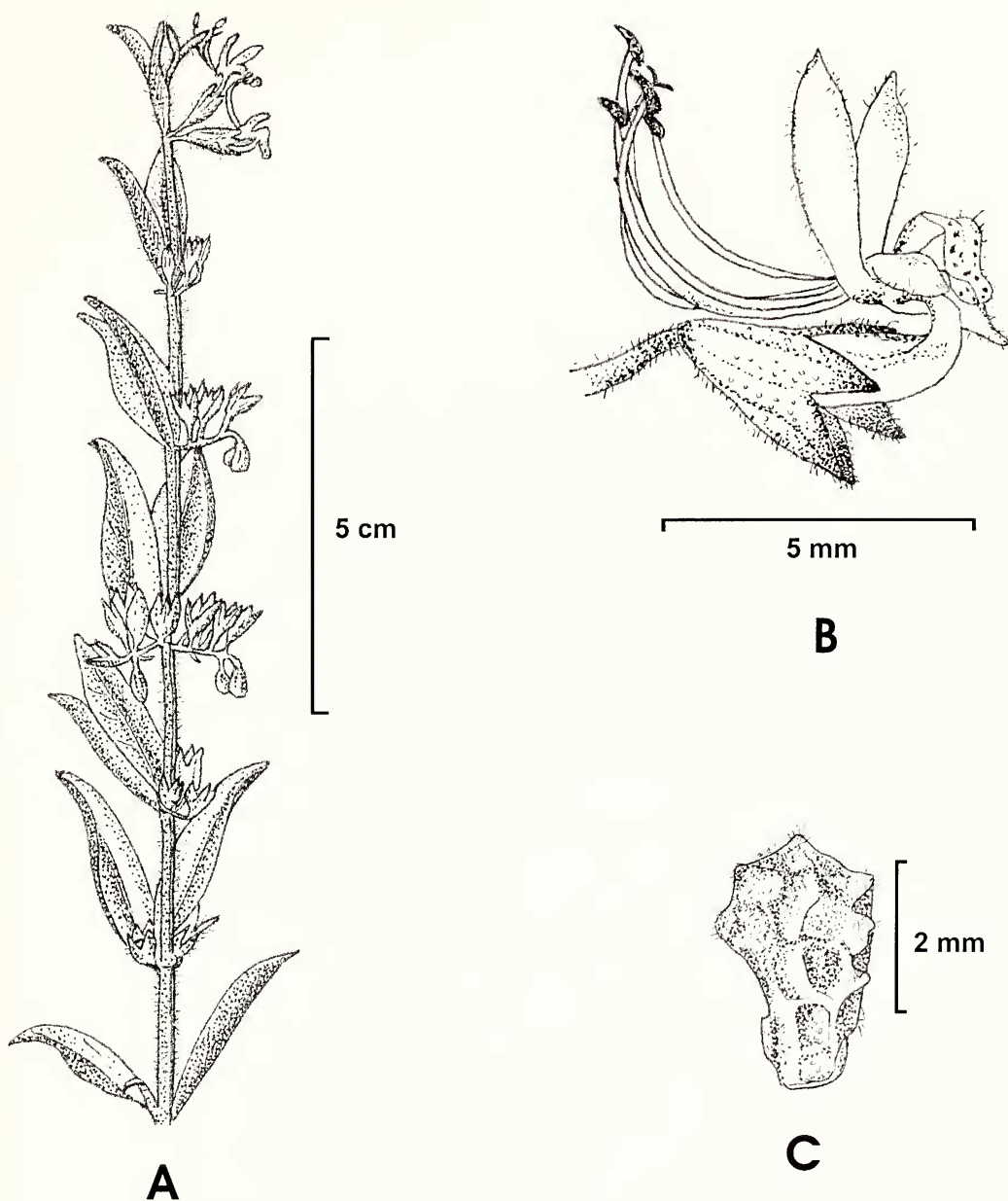


FIG. 1. *Trichostema ruygtii*. A. Habit. B. Flower. C. Nutlet.

*Trichostema ruygtii* flowers from June to October in open sunny areas associated with a variety of vegetation types, primarily oak woodland with various species of oaks, but also chaparral, grassland (former woodland) and yellow pine-Douglas fir forest. It is generally found on thin clay soils on dry rocky slopes and flats that are often adjacent to exposed volcanic bedrock of the Sonoma Volcanic Formation. Some sites are seasonally saturated, including Northern Volcanic vernal pools.

Populations are known from 19 localities in the Napa Range and eastern interface with Napa Valley at elevations of 30 to 600 m (Fig. 2).

Fifteen of these are documented by collections and four others are based on recent observation of populations not far from documented sites.

*Type.* California, Napa County. Mead Ranch, 2.4 km southwest of Foss Valley, *J. Ruygt 3089*, 11 July 1992. Opening in chamise chaparral.

Elevation 475 m. (Holotype: JEPS; Isotypes: CAS, LA, RSA, MO).

Documented locations: 2.4 km southwest of Foss Valley (Mead Ranch), *Ruygt 3089*; 3 miles NE of Napa, 1.9 km SE of intersection of Third Avenue and Hagen Road, *Ruygt 4628*; Soda Canyon Road, 0.5 km north of Loma Vista Dr.,

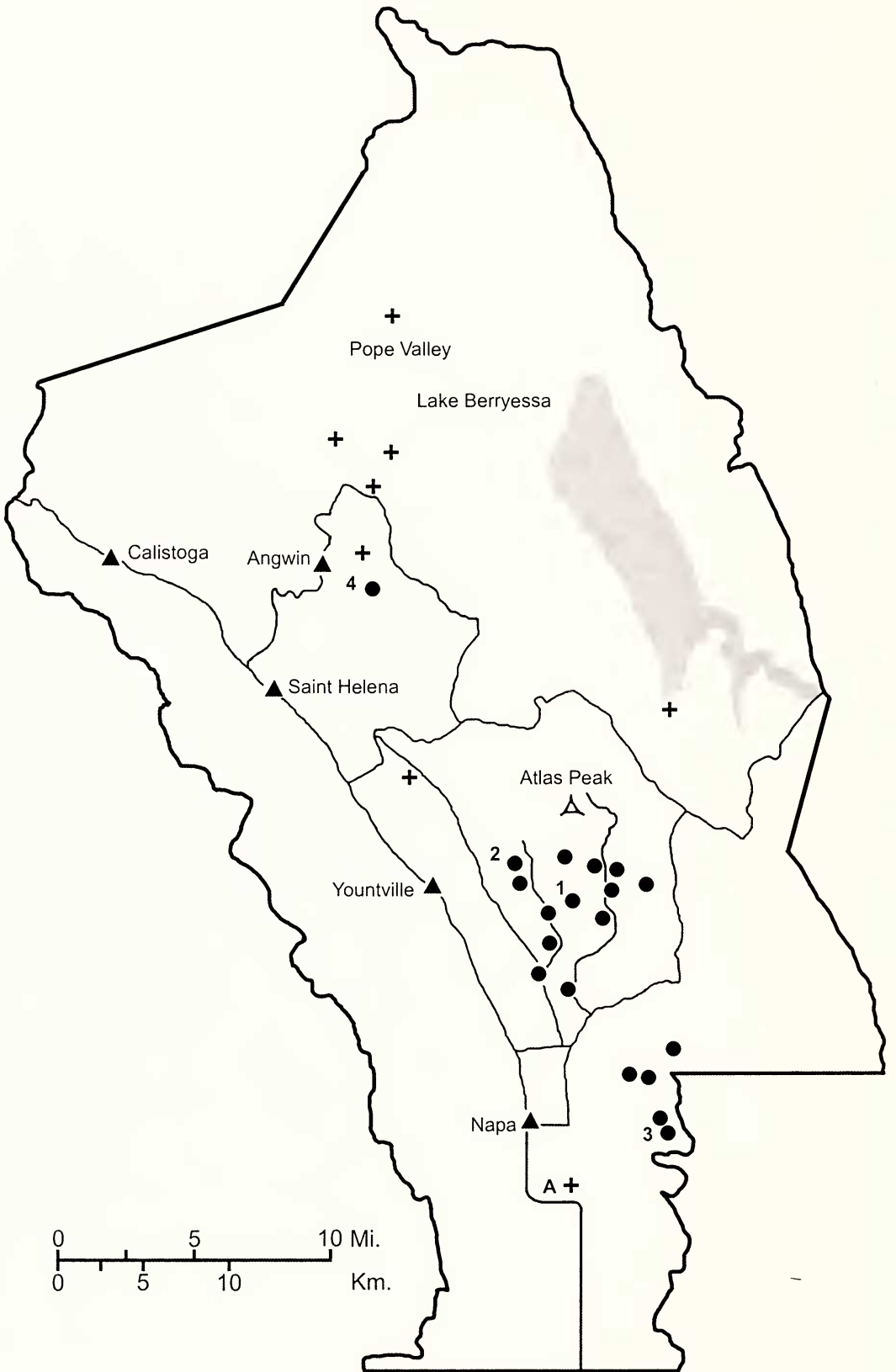


FIG. 2. Distribution of *Trichostema ruygii* (●) and *T. lanceolatum* (+) in Napa County, California.

TABLE 1. LOCATIONS OF SAMPLED POPULATIONS AND VOUCHER COLLECTIONS.

*Trichostema ruygtii*

1. 2.4 km southwest of Foss Valley (Mead Ranch), *Ruygt 3089* (Type locality)
2. North end of Stag's Leap, *Ruygt 4644*
3. East end of Green Valley Road, 0.89 km west of Wild Horse Falls, *Ruygt 4640*
4. Las Posadas State Forest, northwest of fire station, *Ruygt 2808*

*Trichostema lanceolatum*

- A. Napa County, 5.1 km S of Napa (Courthouse), east side of Napa Valley Corporate Road, *Ruygt 4649*
- B. Los Angeles County, Santa Monica Mountains National Recreation Area, Mulholland Highway, 1.6 km east of Malibu Canyon/Las Virgenes Road, *H. Lewis 1480*

*Ruygt 4632*; Atlas Peak Rd., 11.4 km north of Monticello Rd. (Foss Valley), *Ruygt 737*; Buzard's Roost, 0.5 km east of Stag's Leap, 5 km ENE of Yountville, *Ruygt 4638*; north end of Stag's Leap, *Ruygt 4644*; east of end of Green Valley Road, 0.9 km west of Wild Horse Falls, *Ruygt 4640*; Las Posadas State Forest, NW of fire station, *Callizo*, 11 Aug. 1985; *Huang*, 12 Aug. 1997; *Ruygt 2808*; Atlas Peak Rd., 6.8 km north of Westgate Drive, 0.9 km SSE of Foss Valley, *Ruygt 1855*; Atlas Peak Rd., 0.5 km north of Hardman Ave., *Ruygt 4648*; Soda Springs Rd., 0.5 km east of Soda Canyon Rd., *Ruygt 4666*; near Circle Oaks, on ridgetop 1.5 km west of "Munson Ranch", *Ruygt 4677*; Wild Horse Valley Ranch, 1.4 km north of Lake Madigan, *Ruygt 3062*; NW Foss Valley (Antinori Vineyards), 3.1 km SSW of Atlas Peak, *Ruygt 4433*.

Other locations: West of Milliken Reservoir near Atlas Peak Road; Soda Canyon Road, 0.4 km north of Silverado Trail; northeast of Napa, Third Avenue at Napa Valley Country Club, 0.9 km SE of intersection of Third Ave. and Hagen Road; SE Foss Valley, 1.2 km SE of Atlas Peak schoolhouse.

Although all recent collections and observations have been made in Napa County, *T. ruygtii* may occur in adjacent counties. The Wild Horse Valley to Twin Sisters area in Solano County seems promising and a collection from Lake County is known. This collection by Pauline Schulthess, July 15, 1931, on a ranch 2.4 km southwest of Kelseyville (LA, UC) is about 60 km NW of the closest known population of *T. ruygtii* in Napa County. A recent survey of the

area disclosed three populations of *T. lanceolatum* but no trace of *T. ruygtii*, which may have been extirpated by development in the area since 1931.

Based on observations and measurements of living populations (Table 1) supplemented by data for *T. lanceolatum* from an earlier study of herbarium specimens (Lewis 1945), there can be little question of a very close relationship between *T. ruygtii* and *T. lanceolatum*, the most widely occurring species of the genus in western North America. *Trichostema ruygtii* is scarcely distinguishable in habit and vegetative characteristics from *T. lanceolatum* and the flowers of both species are similar in having an unusual conformation of the corolla, with the corolla tube bending back sharply as it narrows near the throat. However, except for the calyx and ovary, the flowers of *T. lanceolatum* are conspicuously larger (Table 2) with notably longer stamens that have larger anthers, about 1.5 mm long. The species also differ in the position of the stigma, which is exerted 1–2 mm beyond the anthers in *T. lanceolatum* and not exerted in *T. ruygtii*. These differences are correlated with seed set, which Ruygt observed to be high in *T. ruygtii*. His data from 20 plants at the type locality (Population 1, Table 1) gave a value of 87% whereas Spira (1980) reported 44% for *T. lanceolatum* and my data from Population B (Table 1) gave 49%. Differences in proportions are also evident (Table 3).

The small flowers of *Trichostema ruygtii*, the position of the stigma, and a high seed set suggest to me that it is a self-pollinating derivative of *T.*

TABLE 2. *TRICHOSTEMA* FLOWER MEASUREMENTS. Measurements in mm: mean  $\pm$  standard deviation. Sample size: Populations 1, 2, 3, 4, and A = 20; B = 15.

	Calyx			Corolla				
	Total	Lobe	Tube	Upper lobe	Lower lobe	Lip	Stamens	
<i>T. ruygtii</i>								
	1	4.35 $\pm$ 0.39	1.91 $\pm$ 0.39	6.05 $\pm$ 0.48	2.43 $\pm$ 0.34	2.24 $\pm$ 0.33	3.35 $\pm$ 0.59	6.50 $\pm$ 0.74
	2	4.54 $\pm$ 0.39	2.26 $\pm$ 0.36	6.08 $\pm$ 0.52	2.78 $\pm$ 0.30	2.68 $\pm$ 0.37	3.14 $\pm$ 0.47	7.68 $\pm$ 0.60
	3	4.90 $\pm$ 0.44	2.33 $\pm$ 0.41	6.72 $\pm$ 0.47	3.24 $\pm$ 0.26	3.03 $\pm$ 0.28	3.81 $\pm$ 0.63	7.78 $\pm$ 0.55
	4	4.12 $\pm$ 0.34	1.58 $\pm$ 0.27	5.93 $\pm$ 0.54	2.48 $\pm$ 0.35	2.37 $\pm$ 0.30	3.54 $\pm$ 0.34	6.90 $\pm$ 0.64
Species mean		4.48 $\pm$ 0.39	2.02 $\pm$ 0.36	6.20 $\pm$ 0.50	2.73 $\pm$ 0.31	2.58 $\pm$ 0.32	3.46 $\pm$ 0.51	7.46 $\pm$ 0.63
<i>T. lanceolatum</i>								
	A	3.94 $\pm$ 0.51	1.69 $\pm$ 0.59	8.19 $\pm$ 0.71	5.62 $\pm$ 0.68	4.18 $\pm$ 0.59	5.28 $\pm$ 0.72	16.47 $\pm$ 1.09
	B	5.31 $\pm$ 0.56	2.90 $\pm$ 0.54	6.71 $\pm$ 0.99	6.10 $\pm$ 0.78	4.97 $\pm$ 0.62	6.27 $\pm$ 0.94	19.73 $\pm$ 2.25
Species mean		4.62 $\pm$ 0.54	2.30 $\pm$ 0.56	7.45 $\pm$ 0.85	5.86 $\pm$ 0.73	4.58 $\pm$ 0.60	5.78 $\pm$ 0.83	18.10 $\pm$ 1.67



TABLE 3. *TRICHOSTEMA* FLOWER MEASUREMENT RATIOS.

	Corolla tube			Stamens		
	Calyx	Upper lobe	Lip	Calyx	Corolla tube	Lip
<i>T. ruygtii</i>	1.38	2.27	1.79	1.67	1.20	2.16
<i>T. lanceolatum</i>	1.61	1.27	1.34	3.92	2.43	3.13

*lanceolatum*. Self-pollination is common in *Trichostema*. All of the California species have been found to be self-compatible and four of the eight annual species studied by Spira (1980) were deemed to be autogamous. The four autogamous species, *T. micranthum*, *T. austromontanum*, *T. oblongum*, and *T. simulatum*, have small flowers, with no measurable nectar and the stigma not exerted beyond the anthers. Potential pollinators were lacking in three and rare in one (*T. oblongum*). DNA studies by Huang (2002) indicate that two of the autogamous species, *T. oblongum* and *T. austromontanum*, are closely related. Her results together with the DNA study of Armstrong and Crawford (1960) tend to substantiate the suggestion of Lewis (1960) that *T. oblongum* is one of the diploid parental species of the allotetraploid *T. austromontanum*. However, none of these species shows the close relationship with an outcrossing species as *T. ruygtii* does to *T. lanceolatum*.

The DNA data of Huang (2002) indicate a very close relationship between *T. ruygtii* and *T. ovatum* (*T. ruygtii* was used to represent *T. lanceolatum* based on my identification of her material from Napa County in 1997; unfortunately, *T. lanceolatum* was not included in her studies). *Trichostema ovatum* is undoubtedly closely related to *T. lanceolatum* but differs most obviously in having smaller flowers and ovate rather than lanceolate leaves. According to Spira (1980) *T. ovatum*, like *T. lanceolatum*, has the stigma exerted beyond the anthers, nectar is produced, and flowers are visited by potential pollinators. However, of seven collections of *T. ovatum* locally available (LA), two have flowers for which the position of the stigma could be determined (Fresno Co. Mendota, *R. F. Hoover 2616*; Kern Co. Famoso, *R. F. Hoover 2674*). The stigma is not exerted beyond the anthers in either collection. Spira observed visits by three bee species during 14 hours of observation compared to seven species of bees observed to visit *T. lanceolatum* during a slightly longer period of time. Jake Ruygt observed visits to *T. ruygtii* by a species of skipper, a small native bee, a minute wasp or bee, and a bee fly. These visitors probably facilitate self-pollination and permit a small amount of outcrossing. Seed set was found by Spira to be about 93% for *T. ovatum*, comparable to that of autogamous species, including *T. ruygtii* and much higher than for *T. lanceolatum* (43.9%).

*Trichostema ovatum* occurs in a relatively small area in the southern San Joaquin Valley of California at elevations below 200 m. Like *T. ruygtii*, the area of distribution is distinct from that of *T. lanceolatum*, which is found in the surrounding area. *Trichostema ruygtii* and *T. lanceolatum* are not known to occur together; the closest known existing populations are separated by a distance of about 7.5 km. Ordinarily *T. ovatum* and *T. lanceolatum* are not found together but I once found a mixed population in a disturbed site along a road adjacent to cultivated fields at the northwestern margin of distribution of *T. ovatum*. Careful examination disclosed no hybrids. This led to the conclusion that the two taxa represent distinct species and not ecogeographic subspecies, as morphological similarities might suggest. Since *T. ruygtii* differs consistently from *T. lanceolatum* to a degree comparable to that of *T. ovatum* and no intermediates are known it seems desirable to recognize *T. ruygtii* as a species distinct from *T. lanceolatum*, a species from which both *T. ovatum* and *T. ruygtii* seem to have been derived.

I was curious as to how *Trichostema ruygtii* could have been misidentified as *T. rubisepalum* and why Mingjuan Huang went to look for *T. rubisepalum* in Napa County, far out of its known range. I found reasonable answers to both questions. Twenty years ago *A Flora of California* (Munz 1959) was in general use. An attempt to identify *T. ruygtii* using the key to *Trichostema* in that manual leads one to *T. rubisepalum* and the synoptic description of that species lists only traits that do not exclude *T. ruygtii*. Using the key in the current *Jepson Manual* (Hickman 1993) to try to identify *T. ruygtii* would probably lead to frustration rather than to the wrong species. However, in reading the description of *T. rubisepalum* in the *Jepson Manual*, I was startled to find that it is alleged to occur in Napa County! How this egregious error became inserted is hard to understand. I have been unable to locate any specimen in a major herbarium that purports to document what would be a very substantial extension of range of this rare species. As indicated above, Jake Ruygt has for many years been reporting new locations of "*T. rubisepalum*" in Napa County to the California Natural Diversity Database, providing a possible source of erroneous information. A note from Jake Ruygt assures me that my analysis and conclusion are correct.

Reports of a significant extension of range should not be included in any flora or checklist without documentation and verification.

KEY TO ANNUAL SPECIES OF *TRICHOSTEMA* IN CALIFORNIA

1. Petiole distinct, 5–15 mm long
  2. Corolla tube 4–8 mm long, exerted, lower lip 4–7 mm long . . . . . *T. laxum*
  - 2' Corolla tube 1.5–3 mm, included, lower lip 2–3 mm . . . . . *T. simulatum*
- 1' Petiole indistinct or less than 5 mm long
  3. Corolla tube bent abruptly back as it narrows near the throat
    4. Stamens less than 10 mm long . . . . . *T. ruygtii*
    - 4' Stamens 10–20 mm long
      5. Leaf blade lanceolate, 2–7 cm long, greater than  $3 \times$  width; corolla tube 5–10 mm long . . . . . *T. lanceolatum*
      - 5' Leaf blade ovate, 1–2 cm long, less than  $2 \times$  width; corolla tube 2.5–5.5 mm long . . . *T. ovatum*
  - 3' Corolla tube curved gradually upward, not narrowed
    6. Hairs on stems and leaves curled or appressed; stamens 2–3 mm long, included or barely exerted . . . . . *T. micranthum*
    - 6' At least some hairs on stems and leaves straight, spreading; stamens 3–6 mm long, exerted
      7. Calyx lobes less than  $2 \times$  tube; calyx tube longer than mature nutlets; mature calyx generally red-tinged . . . . . *T. rubisepalum*
      - 7' Calyx lobes longer than  $2 \times$  tube; calyx tube shorter than mature nutlets; mature calyx green
        8. Leaf blade generally less than  $4 \times$  width; calyx lobes widest above base . . . . . *T. oblongum*
        - 8' Leaf blade generally greater than  $4 \times$  width; calyx lobes widest at the base . . . . . *T. austromontanum*

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